TESTIMONY OF ARPAD A. BERGH,
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to the
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
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"S. 1166 - THE NEXT GENERATION LIGHTING INITIATIVE ACT"

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On behalf of the Optoelectronics Industry Development Association ("OIDA"), I would like to offer support for a government-industry initiative to develop a new form of energy efficient lighting based on solid state optoelectronics. In particular, OIDA endorses legislation recently introduced by Senators Jeff Bingaman and Mike DeWine -- S. 1166 -- that would establish a government-industry initiative to accelerate the development of solid state lighting.

The "Next Generation Lighting Initiative Act" would create a 10-year program for the Department of Energy and a consortium of the solid state lighting industry for the purposes of conducting the research and development necessary to enable solid state lighting to become a primary source for the nation's general lighting needs.

OIDA is a non-profit association of optoelectronics companies, national laboratories and universities established to strengthen and advance optoelectronics technology. OIDA members are leaders in the research and development of new enabling optoelectronics technologies for areas such as fiber optic communications, digital imaging, and optical storage.

Optoelectronics involves the merging of optics and electronics into various complementary devices and has become a strategic enabling technology in today's information-based economy. Optoelectronics applications extend broadly through society, including the fields of computing, communication, entertainment, education, electronic commerce, health care and transportation. Optoelectronics defense applications include military command and control functions, imaging, radar, aviation sensors, and optically-guided weapons.

OIDA urges the Congress to pass S. 1166 expeditiously in order to achieve the considerable benefits of energy savings, productivity gains, and consumer advancements that would come from full scale development of solid state lighting.

Dominant Lighting Technologies

Lighting technology is currently dominated by the incandescent light bulb and the fluorescent light tube. These two light sources are the primary means for general lighting in the United States and throughout the world. Despite the dominant role of these light-

ing technologies, neither has achieved significant advancements in energy efficiency over the past several decades. This is all the more noteworthy given that approximately 70 percent of the energy used by these lighting technologies is wasted as heat.

Incandescent and fluorescent lighting, as well as certain other forms of lighting currently available, are very energy-inefficient. These forms of lighting convert only a small portion of the consumed electric energy into visible light. A 100 watt incandescent light bulb, for instance, emits only 5 percent of the energy it uses as useful light, while the equivalent figure for the more efficient fluorescent tube is less than 30 percent. These inefficiencies are dictated by physics and are not subject to significant improvement.

Lighting consumes a significant portion of the energy generated in the United States -- approximately 20 percent -- and this share is growing. It is widely accepted that the United States must pursue strategies for limiting the growth of its energy consumption devoted to lighting needs. Conservation and improved electronic controls alone will not be sufficient for limiting this energy need. The solution lies with new technologies, principally solid state lighting.

Solid State Lighting

Solid state lighting technology utilizes inorganic and organic semiconductor devices known as light emitting diodes ("LEDs") and organic light emitting diodes ("OLEDs") to convert electricity to light. LEDs have existed for over 30 years and today are used in applications such as digital displays, instrument panel lighting, signage, and traffic signals. LEDs' primary advantages include significantly longer-life and energy efficiency. LEDs' use in highway signs and signals, for example, require 80-90 percent less energy than incandescent signals and have significantly longer running lives. It has been estimated that replacing all existing incandescent traffic signals in the United States with LED signals would save nearly 2.5 billion kilowatt hours annually. OLEDs have the promise of highly efficient low cost, large area, flexible light sources that can be mounted on walls and ceilings or even on furniture.

Unlike incandescent and fluorescent technology, solid state lighting technology is not subject to the same laws of physics that result in the conventional lighting sources' poor energy efficiency. In theory, solid state lighting could achieve near 100 percent electricity-to-light conversion ratio. While actual ratios for solid state lighting have not yet approached such high levels, technological advancements are consistently raising the energy efficiency of solid state lighting.

The adoption of solid state lighting for more general illumination, such as residential and office lighting, has been stymied by the inability to produce solid state "white light", the most common form of lighting used by the general public. This barrier, however, has now been overcome. Several types of white light LEDs have been developed and efforts are on-going to improve on existing white light technology for solid state applications. Nevertheless, the industry faces significant challenges in bringing to market cost-effective white light LEDs.

Solid State Lighting as a Primary Source of General Lighting

Adoption of solid state lighting as a primary source of general lighting in the United States holds the promise of significant and far-reaching benefits:

Energy Efficiency. It is estimated that significant adoption of solid state lighting over the next twenty years could reduce global electricity usage for lighting by 50 percent, and reduce total global electricity consumption by 10 percent. These changes equate to an overall reduction in annual global energy needs of 1,000 terawatt-hours.

Cost Efficiency. Solid state lighting using LEDs will be more cost efficient in terms of product maintenance and replacement. Unlike incandescent bulbs and fluorescent tubes, LEDs are durable, long-lasting, and easier to program and operate.

Environmental Impact. The energy efficiency of LEDs could translate into major cuts in carbon emissions if solid state lighting is adopted broadly. It has been estimated that the United States could avoid 276 metric tons of carbon emissions by 2020 if solid state lighting could garner a significant share of the general lighting market.

Economic Impact. A flourishing solid state lighting industry would have important economic benefits to the United States in terms of employment, growth in supplier and equipment industries, research and development and new applications. Furthermore, as solid state lighting becomes a leading source for general lighting outside the United States, the U.S. solid state lighting and related industries will reap expanded economic benefits for the nation.

Improved Quality and Flexibility. Solid state lighting promises better quality and more versatile sources of lighting, including the ability to tune colors to virtually any shade or tint. In addition, solid state lighting offers other desirable qualities, such as light-weight, thinness, flexibility in deployment, and compatibility with integrated circuits to produce "smart" light.

Based on these important qualities and benefits of solid state lighting, a government-industry solid state lighting initiative would be in the United States' economic and energy security interests. The United States would benefit not only from major energy and cost savings, improved quality, and a positive environmental impact, but also from the ability to enhance and maintain the competitiveness of the U.S. solid state lighting industry at a time when this technology is being aggressively pursued by other nations. These benefits represent a solid foundation and justification for proceeding with a solid state lighting initiative as set forth in S. 1166.

Foreign Development Efforts and the Challenge to the United States

Efforts are underway in other countries to rapidly develop solid state lighting as a viable alternative to conventional lighting technologies. Government-sponsored industry

consortia have been established in Japan, Europe, Korea, and Taiwan to develop more efficient solid state lighting technologies. It is generally believed that without a substantial government/industry commitment in the United States competitors such as Japan and Europe will come to dominate solid state lighting and become the standard-bearers of this important technology.

A national investment is necessary to further develop solid state lighting and to ensure that the United States can obtain a leadership position. This can best be achieved through the cooperation of industry, government, and academia.

The optoelectronics industry, the Department of Energy, and several National Laboratories have been working to develop a coordinated approach to solid state lighting. OIDA itself has put much effort into addressing the necessary requirements for full scale development of solid state lighting. These include much basic research, which is especially suited for universities, harnessing work at the National Laboratories, and the development of an infrastructure of supplier and equipment firms that can be available for the commercialization of this new technology.

The potential for solid state lighting was thoroughly reviewed this spring at a National Academies of Science workshop. Based largely on work from many sources, Senators Jeff Bingaman and Mike DeWine have formulated legislation that reflects the most promising approach to this type of broad-based technology development.

The Next Generation Lighting Initiative Act -- S. 1166

The Next Generation Lighting Initiative Act was introduced on July 11, 2001 and is designed to establish a national research and development infrastructure for bringing about the types of advances in solid state lighting that will allow this technology to become more broadly applied and eventually available as a primary source of general lighting.

The legislation would involve two types of funding for research and development on solid state lighting: 1) direct sponsored research from the Department of Energy, and 2) grants to universities, National Laboratories and infrastructure providers that would be administered by an industry-led consortium.

Industry Consortium. The "Next Generation Lighting Initiative Consortium" would be composed of companies, National Laboratories, and other research entities and would provide basic and manufacturing related research contracts. The consortium would be funded through both membership fees and Department of Energy grants. Entities receiving funding directly from the Department of Energy would obtain full intellectual property rights, while consortium members would have royalty-free access to research results from universities, National Laboratories, and infrastructure providers.

The consortium would provide the framework for the entire program in that it would coordinate with the Department of Energy in assessing technology requirements,

maintain a technology roadmap, and administer the efforts of participating universities, National Laboratories, and supplier and equipment infrastructure firms. All efforts would involve cost sharing.

The consortium is to be broadly representative of entities engaged in solid state lighting research and development. It would have a participation agreement applicable to all members and would be open to all U.S. companies.

The initiative is designed to result in the commercialization of solid state lighting technology. As such, it would involve extensive industry participation. To facilitate such participation, the grants under the research and development funding program would not be subject to the Federal Acquisition Regulations, but rather subject to review by commercial auditors to ensure that funds are expended in a manner consistent with the program's objectives.

Planning Board. The initiative would also establish a Planning Board that would include seven members representative of solid state lighting activity generally. Four members would be appointed by the Secretary of Energy and three members would be nominated by the consortium. It is not intended that the Planning Board would function as a federal advisory committee. Rather, it would have a specific task of developing strategies for solid state lighting. These strategies would be made available to the Department of Energy, the consortium, Congress, and the public.

Annual Review. In addition, the initiative would be subject to an independent annual review by a federal advisory committee or under the auspices of the National Academy of Sciences. In particular, the Board on Science, Technology and Economic Policy of the National Academy of Sciences would be well qualified to conduct such annual reviews.

Funding. The Department of Energy Initiative would authorize up to $480 million in grants for solid state lighting research and development over a period of ten years. The objective of the initiative is to develop by 2011 white LEDs that, compared to incandescent lighting technologies, are longer lasting, more energy efficient, and cost-competitive.

Studies indicate that technology development necessary for commercializing solid state lighting could be achieved within ten years. To realize this goal, however, it will be necessary to make substantial investments in research and development. Based on the critical tasks identified in the solid state lighting industry's roadmaps, it appears that annual funding of approximately $50 million will be necessary to complement current industry efforts. Funding would not continue beyond the point at which this technology is readily available for broad-based applications.

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OIDA strongly endorses the Next Generation Lighting Initiative Act and urges the Congress to enact this important technology development initiative. This legislation offers the best approach for combining the resources of industry, government, and academia in an effort to bring to the commercial marketplace the next generation of lighting technology and to maintain a leadership role for the United States in this important field.

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